

Digestive System

Digestive system

Names: Digestional tract, Digestive tract, GI tract, GIT, Guts, Gastrointestinal tract, and Alimentary canal.

It is a group of organs in the human and animal bodies that work together to convert food to energy and basic nutrients to nourish the body, and expel the remaining waste as feces.

The major organs of the digestive system are:

- **Mouth**
- **Pharynx**
- **Esophagus**
- **Stomach**
- **Small intestine**
- **Large intestine**
- **Rectum**

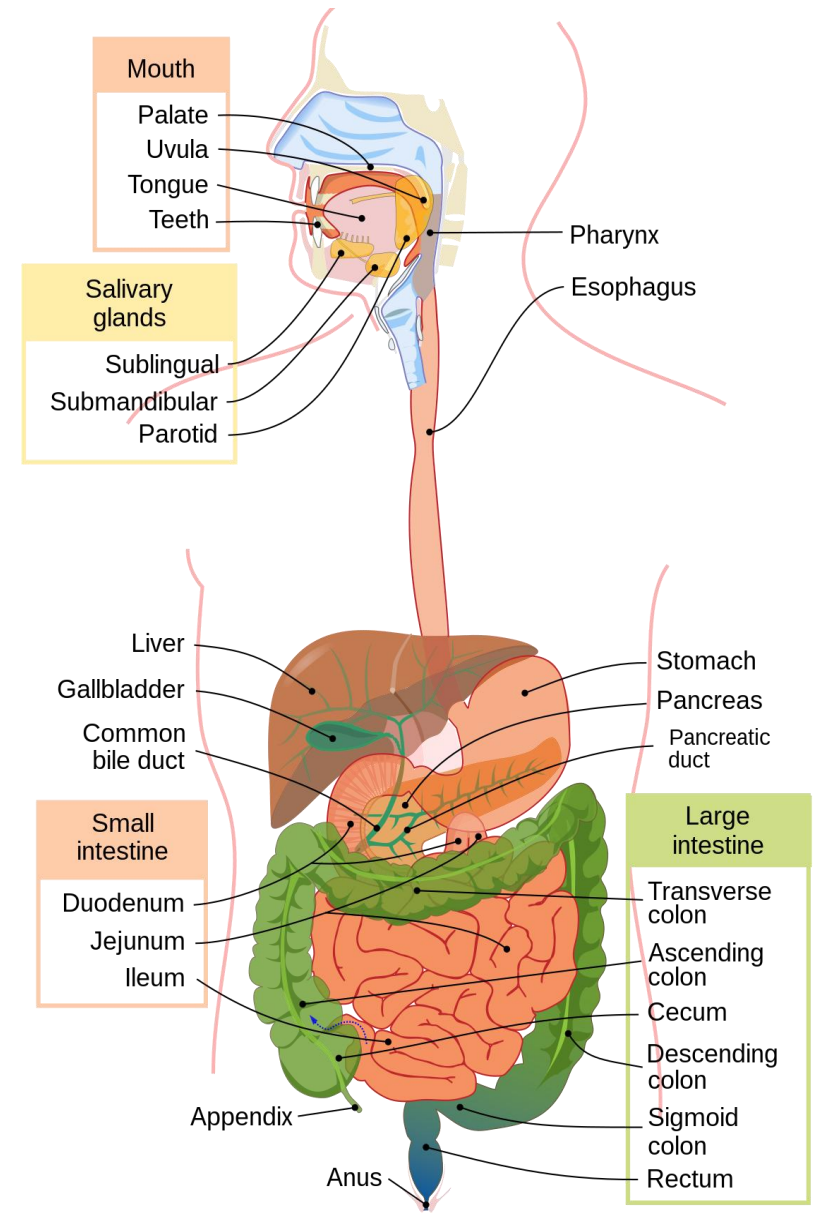
Accessory Digestive organs

✓ Liver

✓ Gallbladder

✓ Pancreas

✓ Salivary glands



Function of GI-tract

Ingestion: Taking of food into the alimentary tract.

propulsion: Mixes and moves the contents along the GIT.

Digestion: which consist of Mechanical breackdown of food(chewing) and chemical digestion of food into small molecules by Enzymes.

Absorption: It's mean that the digested food pass through the wall of GIT into circulation.

Elimination: The food that have been eaten but do not digested or absorbted are excreated from alimentray tract as feces by process called defecation.

Mouth

It's the first portion of the GIT that receives food and produces saliva

The mucous membrane epithelium is lining mouth.

Postion

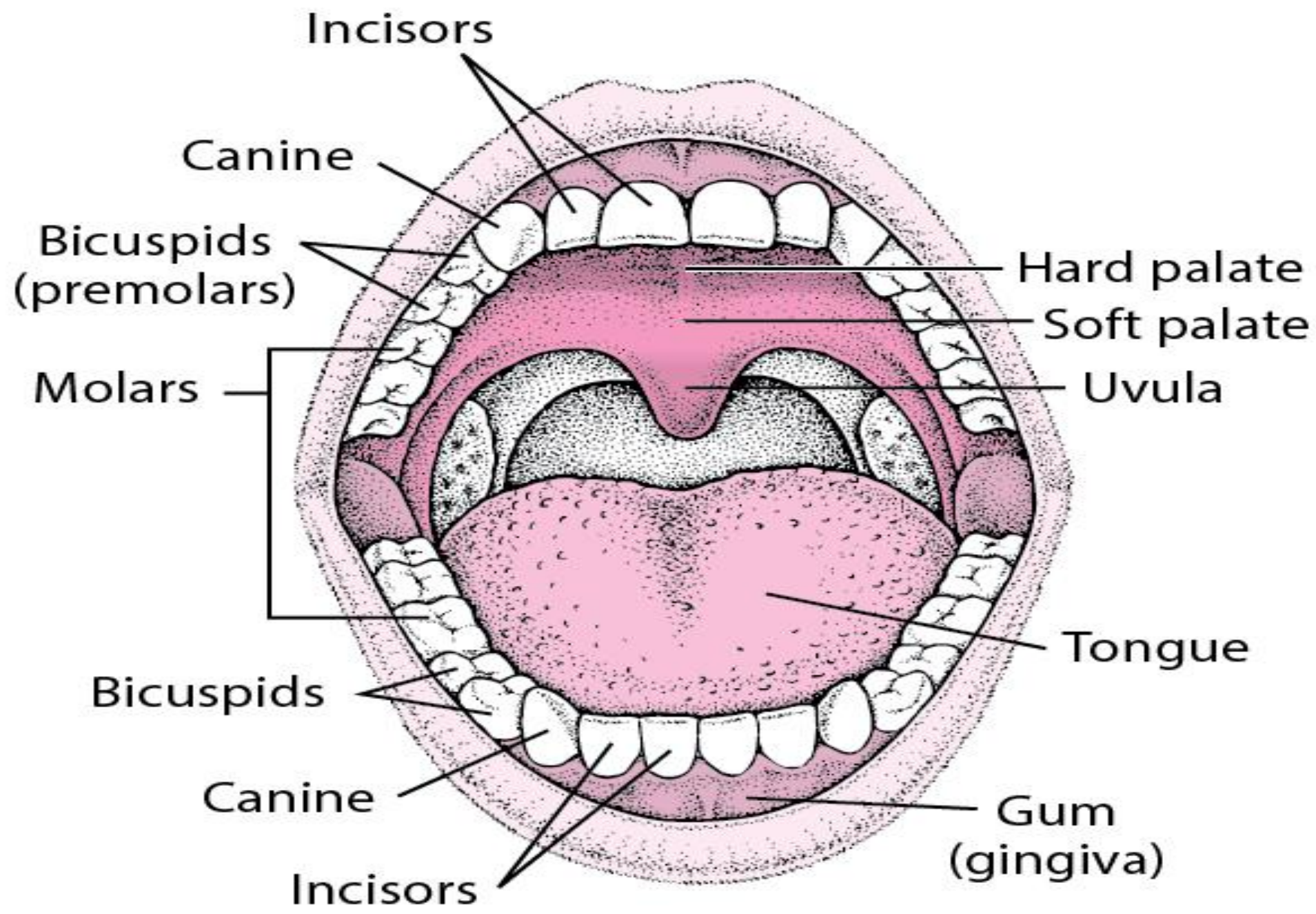
Anterior: Lips

Posterior: Continue with oropharynx

Lateral: muscles of cheeks

Superior: Hard palate

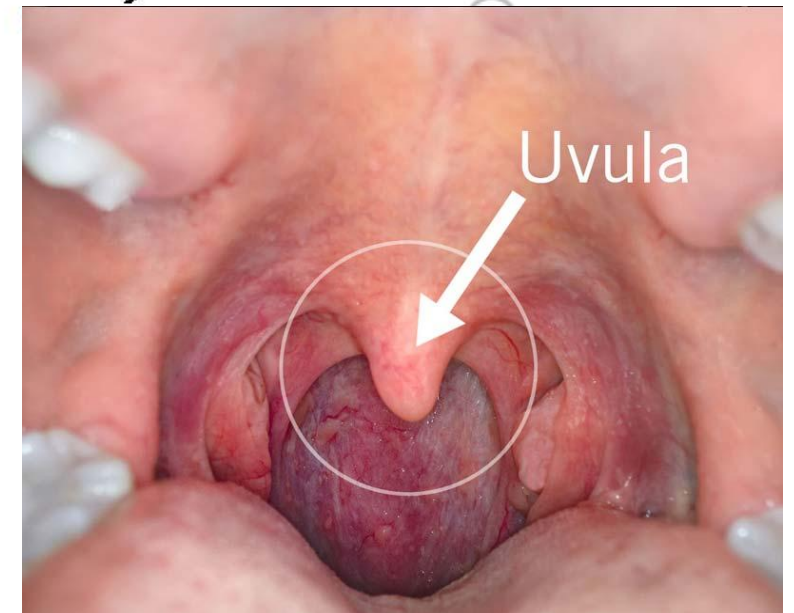
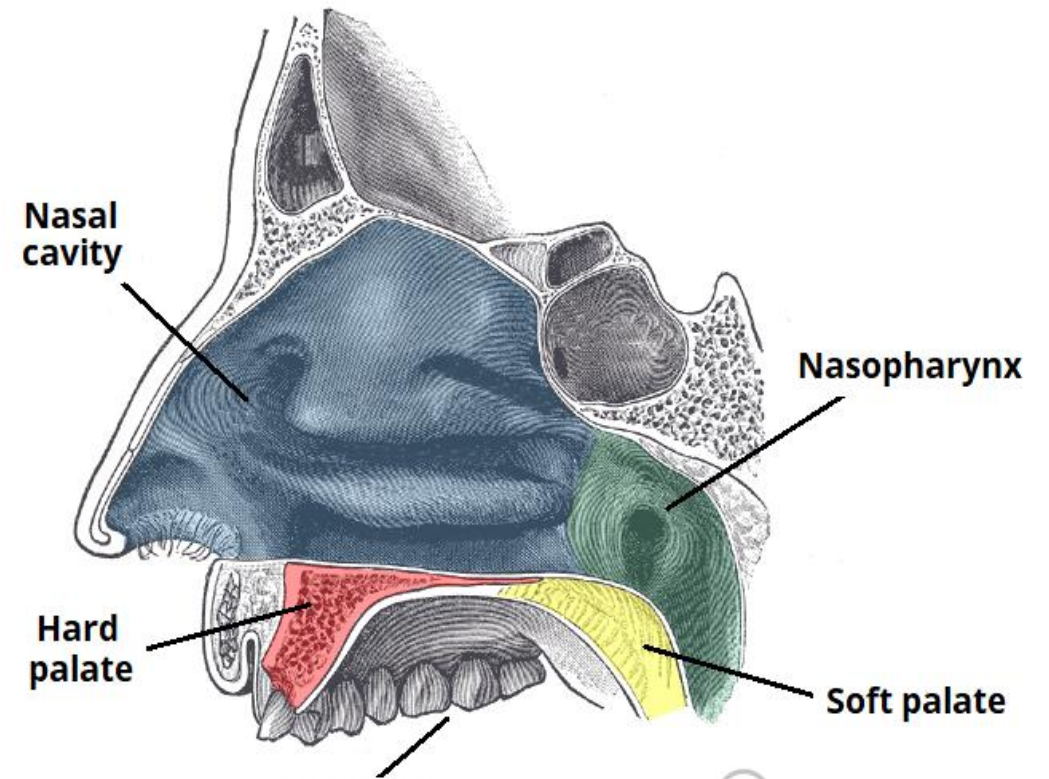
Inferior: Tongue aand soft tissue of the floor of mouth



Mouth Structure

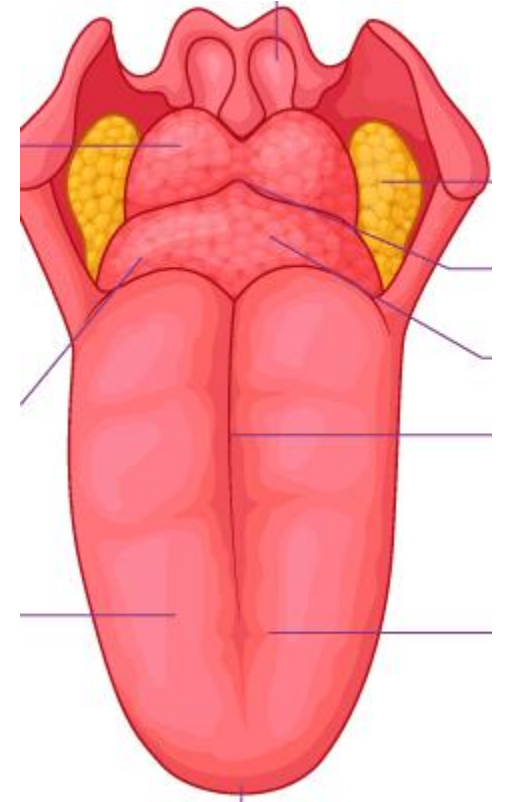
Palate: it make the roof of the mouth and can be divided into two parts; the anterior part called hard palate and the posterior part called soft palate.

Uvula: is a curve fold of muscle covered with Mucous membrane hanging down in the midline.



Tongue

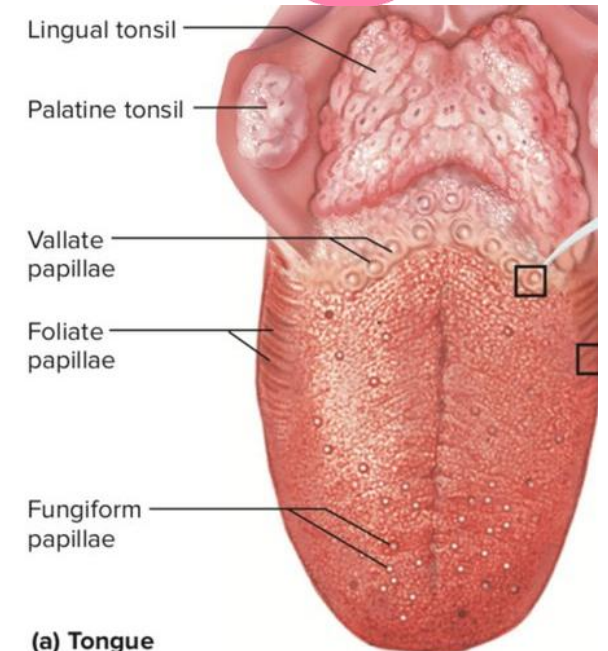
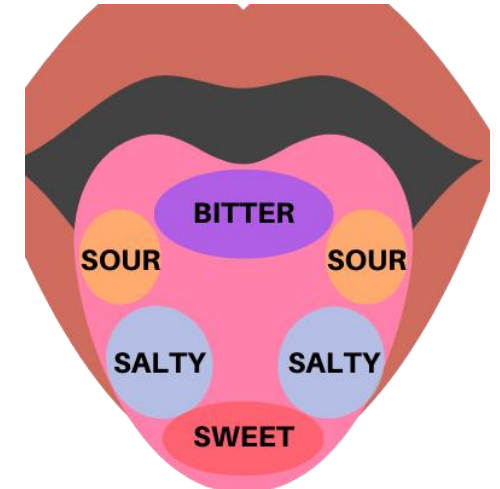
- **Is a muscular organ that located in the mouth.**
- **Tongue function are**
 - **Manipulates food for mastication**
 - **Is used in act of swallowing**
 - **Primary organ of taste in the gustatory system**
 - **Speech.**
- **The tongue can be divided into two parts**
- **Oral part at the front and pharyngeal part at the back**
- **Also, divided into three parts: apex, body, and root.**
- **Blood supply : lingual artery and external carotid artery, lingual vein, internal jugular vein**
- **Nerve supply: hypoglossal N., Glossopharyngeal N(Taste and sensation)**



Taste buds Taste buds are tiny sensory organs that allow you to experience taste, including sweet, salty, sour, bitter and umami. Taste buds regenerate approximately every 10 days, which means injured taste buds usually repair on their own

There are three types of papillae that contain taste buds:

- **Fungiform:** Located on the sides and tip of tongue. They contain approximately 1,600 taste buds.
- **Circumvallate:** Located on the back of tongue. They contain approximately 250 taste buds.
- **Foliate:** Located on the back portion of tongue, on each side. There are about 20 of these papillae, and they contain several hundred taste buds each.



Teeth

Function is to break down the food items mechanically by cutting and crushing them in preparation for digestion

There are four types of teeth; Incisors(cutting), canines(tearing), premolars(crushing), and molars(grinding).

Primary teeth

There are 10 teeth in the maxilla and 10 teeth in the mandible including 2 incisors, 1 canine, and 2 molars.

2,1,0,2-2,1,0,2

Permanent teeth

32 teeth: 16 in maxilla and 16 in mandible.

2,1,2,3-2,1,2,3

Teeth structure

Enamel : The hardest substance in the body . It is highly mineralized part. the color of enamel is light yellow to grayish white.

Dentin : the substance between enamel and cementum 70% inorganic materials, 20 % organic materials, and 10% water.

Cementum: is a specialized bone like substance cover the root of tooth

Dental pulp It is the central part of the tooth filled with soft connective tissue

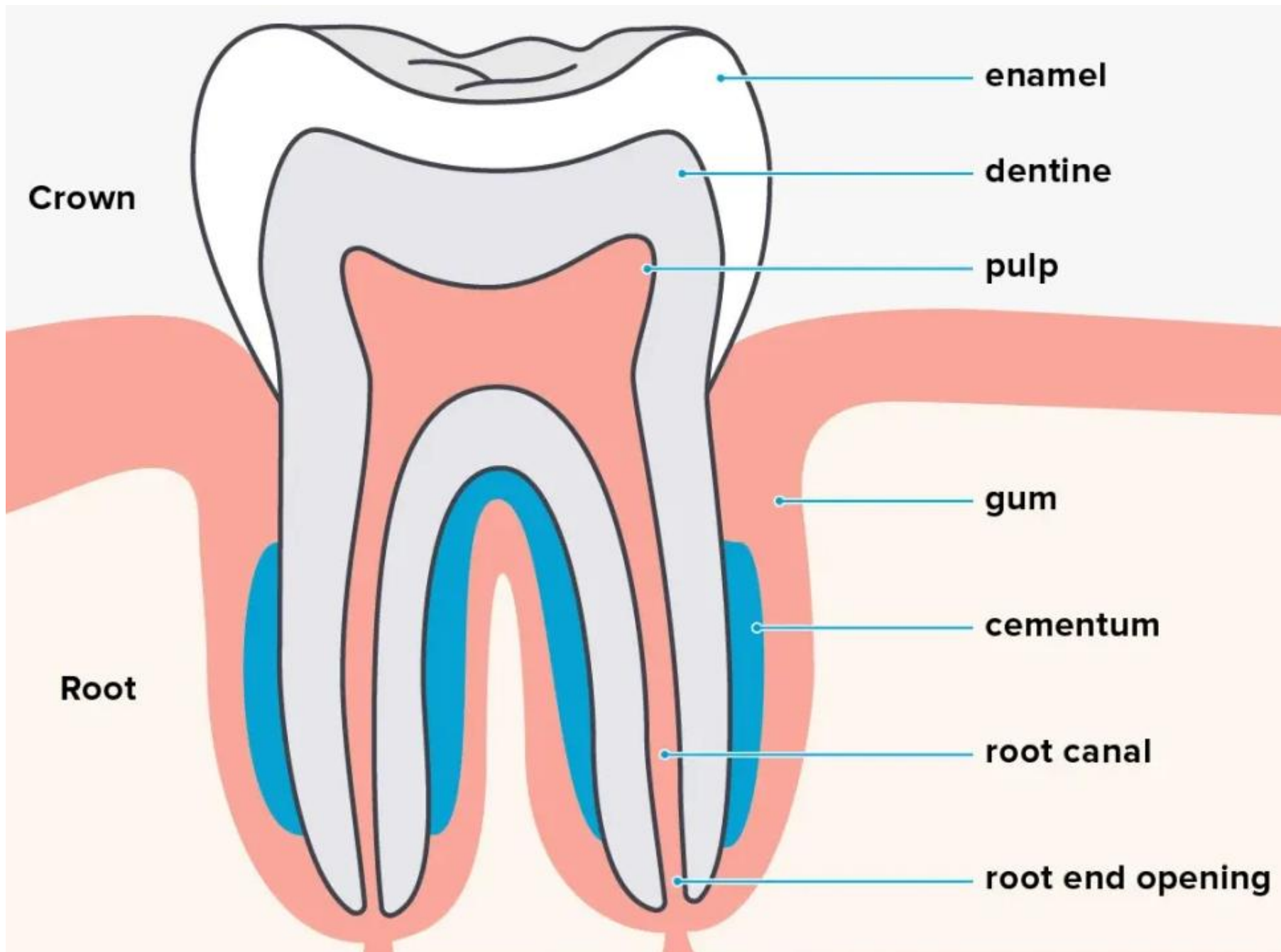
The nerves and blood supply present in the dental pulp.

Blood Supply

- maxillary artery
- Internal jugular vein

Nerve supply

- Maxillary nerve and mandibular nerve.



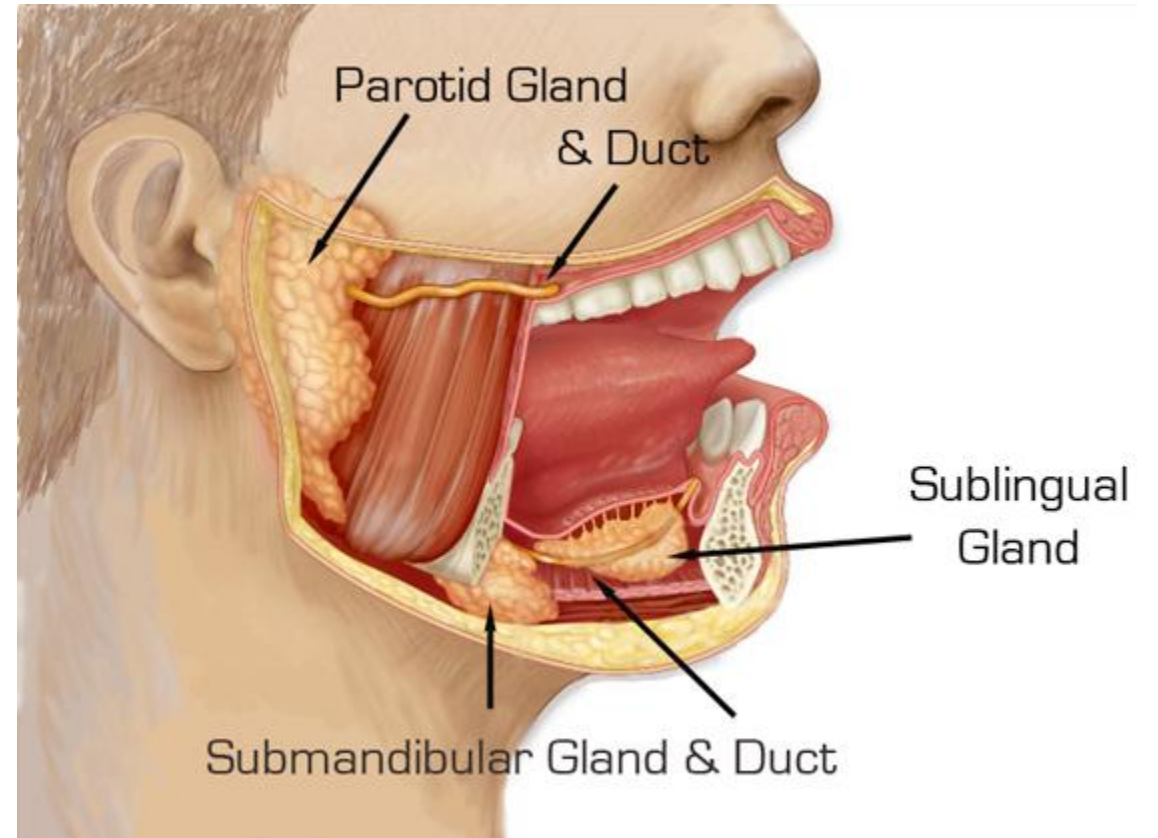
Salivary glands

Salivary glands are exocrine glands that produce saliva through a system of ducts.

The body has major and minor salivary glands.

Three major salivary glands in the body

- **Parotid**
- **Submandibular**
- **Sublingual**



Parotid Glands

Largest salivary glands

Two parotid glands wrapped around mandibular ramus

Release the saliva to oral cavity through parotid duct

secrete saliva and amylase to digest starch.

Submandibular

Two glands located under the lower jaw

mix secretion products (serous and mucus fluid)

release through mandibular duct

Sublingual gland

located inferior to the tongue and anterior to the submandibular glands

secrete mainly mucous and make around 5% of saliva entering oral cavity

Minor salivary glands

about 800-1000

located throughout the oral cavity within submucosa or oral cavity mucosa

Blood supply

External carotid artery, Jugular vein

Composition of saliva

About 1.5 liters of saliva produce daily

- **water**
- **Mineral salts**
- **Enzymes**
- **Mucus**
- **Lysozyme**
- **Immunoglobulins**

Functions

- **Lubrication: protecting oral cavity from trauma during eating (soreness mouth are common in people with less saliva)**
- **Digestion: Moistening the food to make bolus**
- **Tasting: Since saliva is liquid, it make a media to carry chemical material in food to taste cells**
- **Ph regulation**

Pharynx

Part of throat behind the mouth and nasal cavity and above the esophagus and larynx

It connects the oral cavity with esophagus

Esophagus

Muscular tube connecting the pharynx with stomach

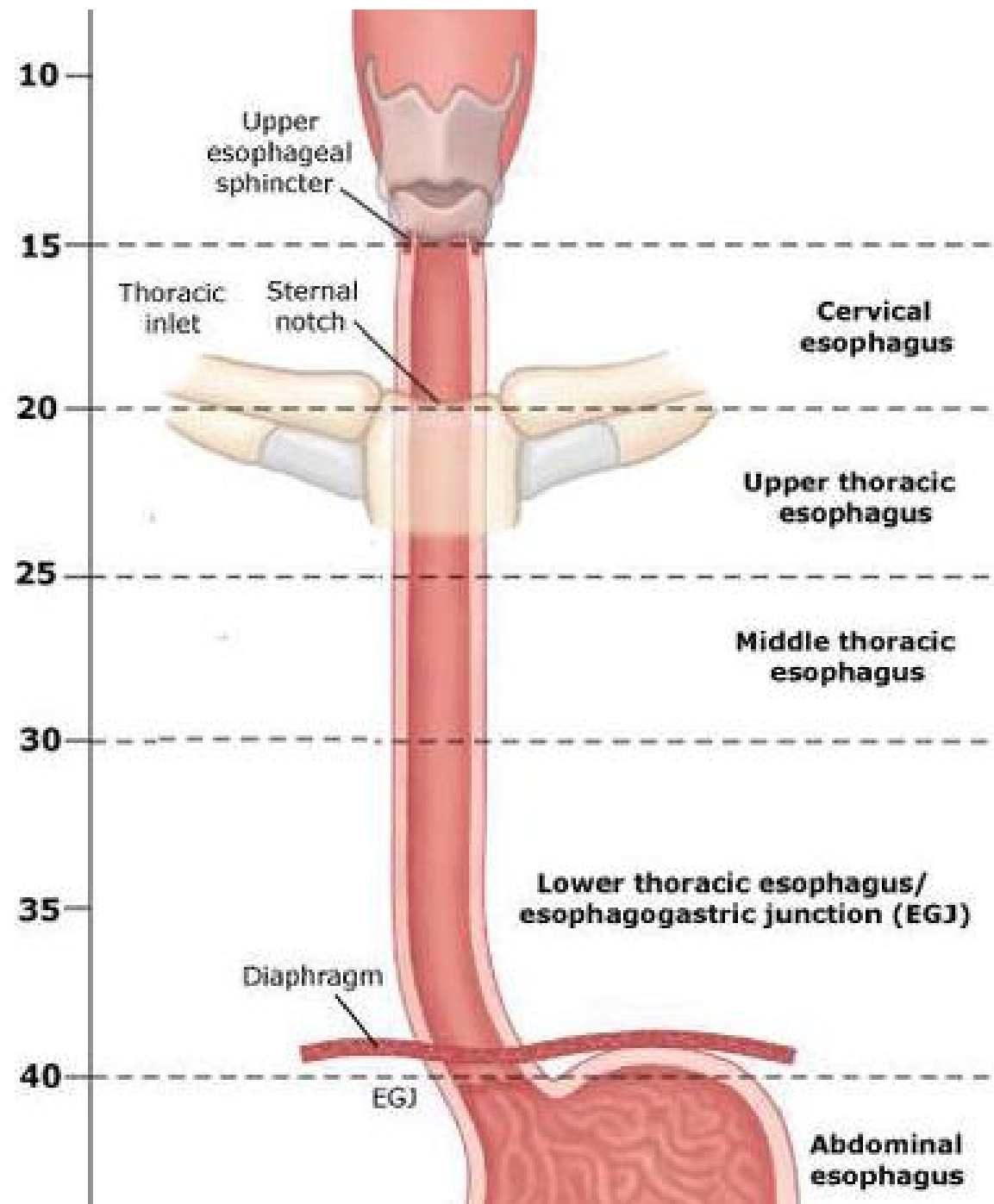
Runs behind the the trachea and heart and front the spine

Length 25 cm

Diameter 2cm

Anatomically divided into

- The cervical portion extends from the cricopharyngeus to the suprasternal notch**
- The thoracic portion extends from the suprasternal notch to the diaphragm**
- The abdominal portion extends from the diaphragm to the cardiac portion of the stomach.**



Esophagus structure

The wall of esophagus contain 4 layers

mucosa

submucosa

layers of muscle

outer layer of C.T.

Two muscular rings or sphincters: muscular structure maintain the constriction of passages.

Lower sphincter prevent reflux of acidic stomach content.

Function: formation bolus and swallowing.

Stomach

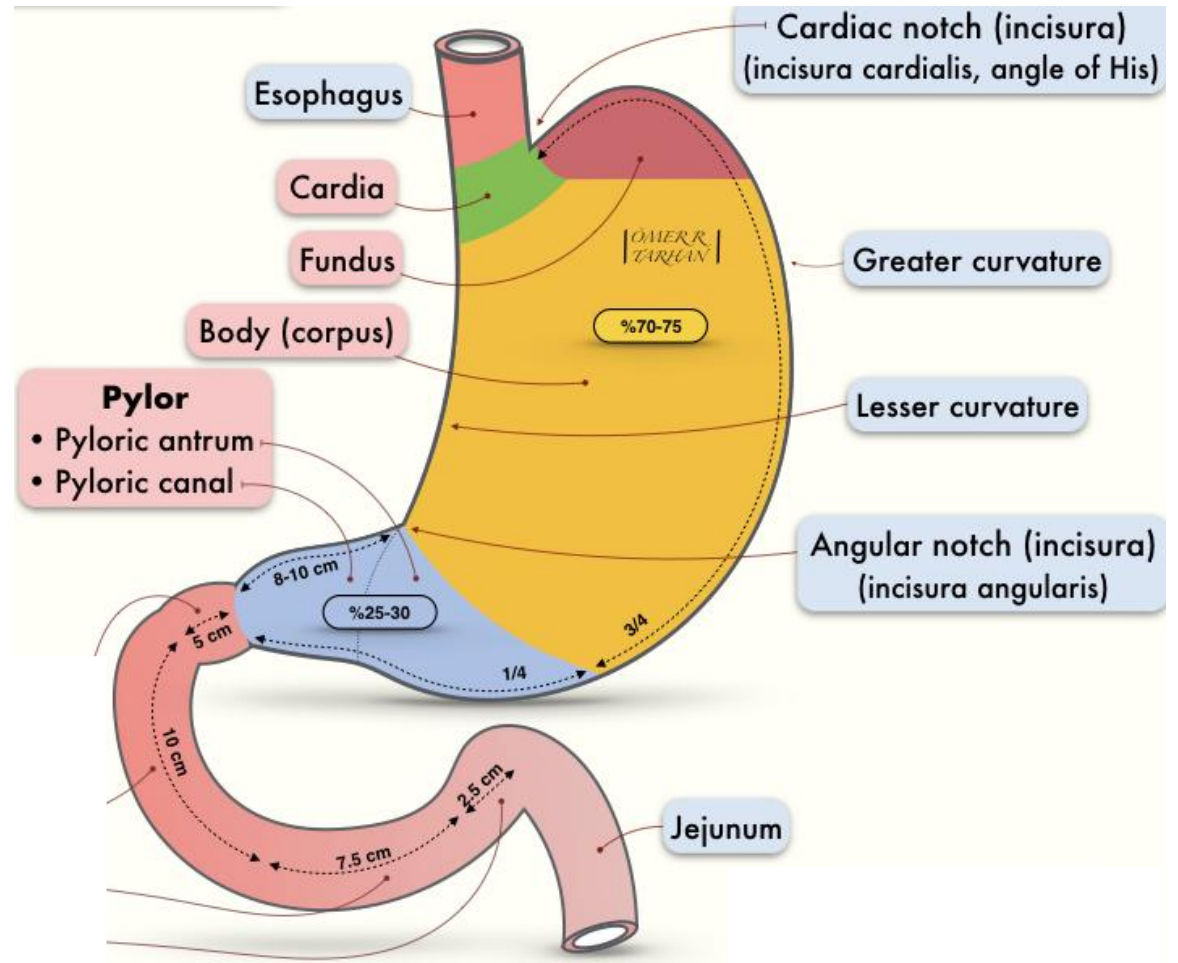
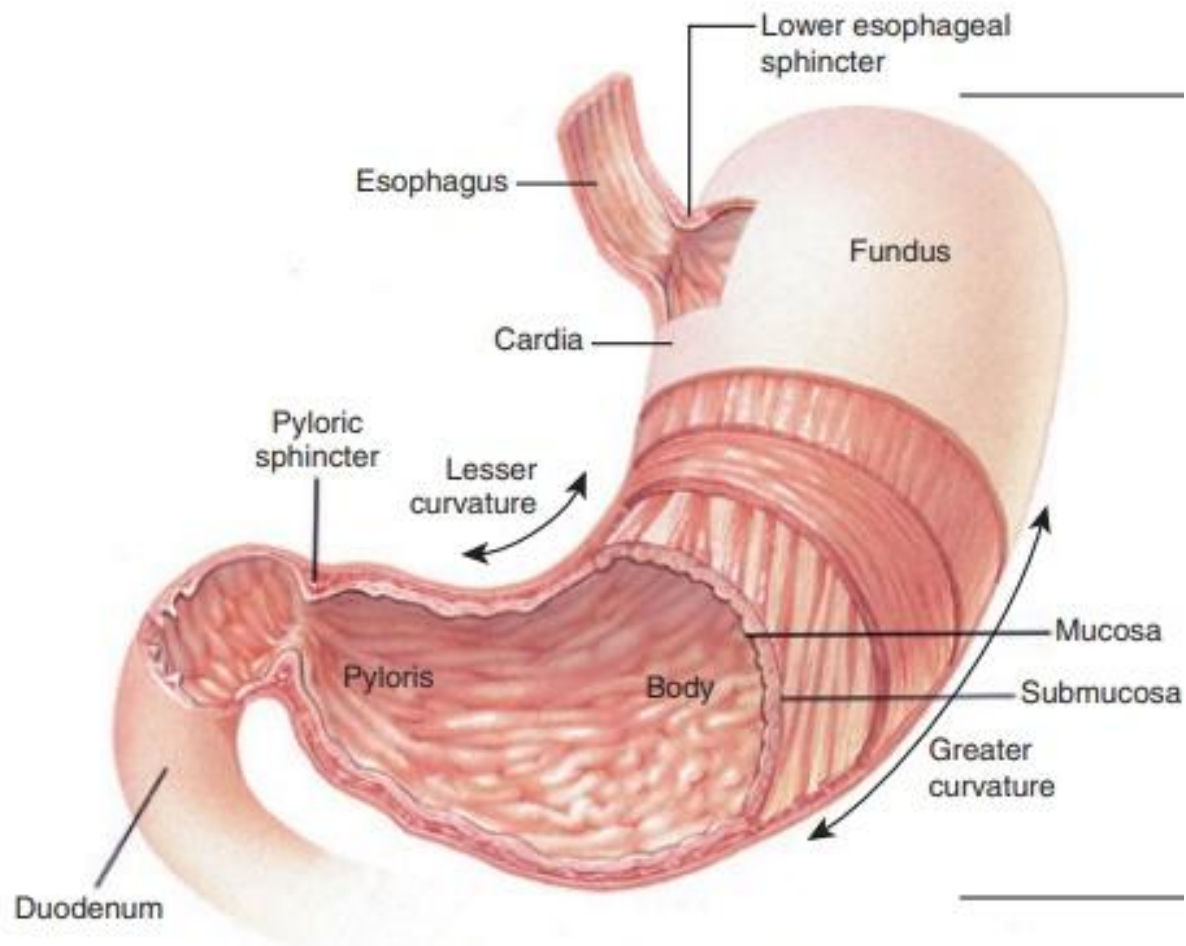
- **The stomach is a muscular organ on the left side of the upper abdomen.**
- **Receives food from esophagus via muscular valve called lower esophagus sphincter**

Relations:

- **Anterior: left lobe of liver and anterior abdominal wall**
- **Posterior: Abdominal aorta, Pancreas, spleen, left kidney**
- **Superior: Diaphragm, esophagus**
- **Inferior: Transverse colon, small intestine**

Stomach

- **A sac like organ designed for food storage (2-4 hours)**
- **Mechanical and chemical digestion occur.**
- **Has two sphincters**
- **Cardiac sphincter near esophagus**
- **Pyloric sphincter: near Small intestine**
- **Stomach divided into four regions**
 - **Cardiac stomach**
 - **Fundic stomach**
 - **body of stomach**
 - **Pyloric stomach**



Stomach Function

Digestion

Releases protease (digestion enzyme like pepsin)

Releases hydrochloric acid (HCl) Provide acidic pH (2) and kill bacteria

Churns food through wall constriction called peristalsis

Absorption very little absorption for certain molecule

Gastric juice

- Its called gastric acid, gastric juice, stomach acid:
- A digestive fluid formed in the stomach
- Contain HCl, KCl, NaCl
- It has role in activating digestive enzymes and make protein unravel to help enzymes break down protein into amino acids.

Gastric Secretory cells

Cheif cells: secrete pepsinogen which then activated to pepsin.

Parietal cells Secrete HCl and intrinsic factor which help in B12 absorption.

Mucous cells: secrete mucous and alkaline materials to help neutralized HCl.

G cells: Secrete hormone called gastrin that stimulates parietal cells.

Stomach Blood supply

Right gastroepiploic A., Left gastroepiploic A., gastric A., and gastric V.

Innervation

- **The autonomic nervous system provides the stomach with parasympathetic and sympathetic nerves.**
- **The vagus nerve supplies parasympathetic innervation via the right posterior and left vagal trunks.**

Liver

An organ works to detoxifies various metabolites, synthesizes proteins, and produces biochemicals help in digestion.

Relations

Anterior: diaphragm and anterior abdominal wall

Posterior: Esophagus, inferior vena cava, aorta, gall bladder, vertebral column, and diaphragm

Lateral: lower ribs and diaphragm

Inferior: stomach, bile ducts, duodenum, hepatic flexure of colon, right kidney.

Structure

Reddish brown organ

Four lobes with unequal size and shape

weight : 1.44 1.66 kg

width: 15 cm

consider heaviest internal organ and largest gland in the body

Liver

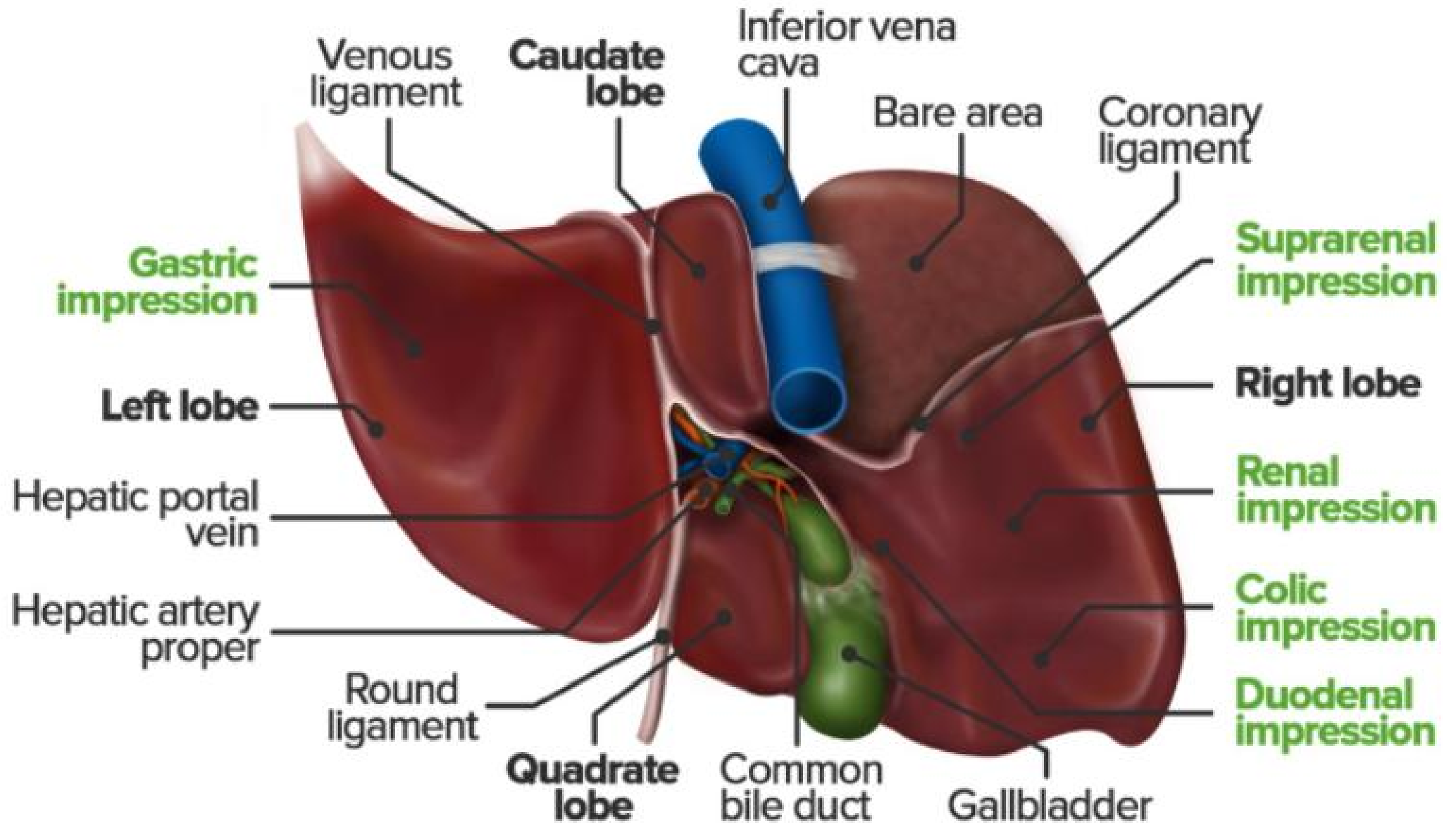
- The liver divided into two lobes when viewed from above; left and right lobe
- Both lobes divided by falciform ligament.

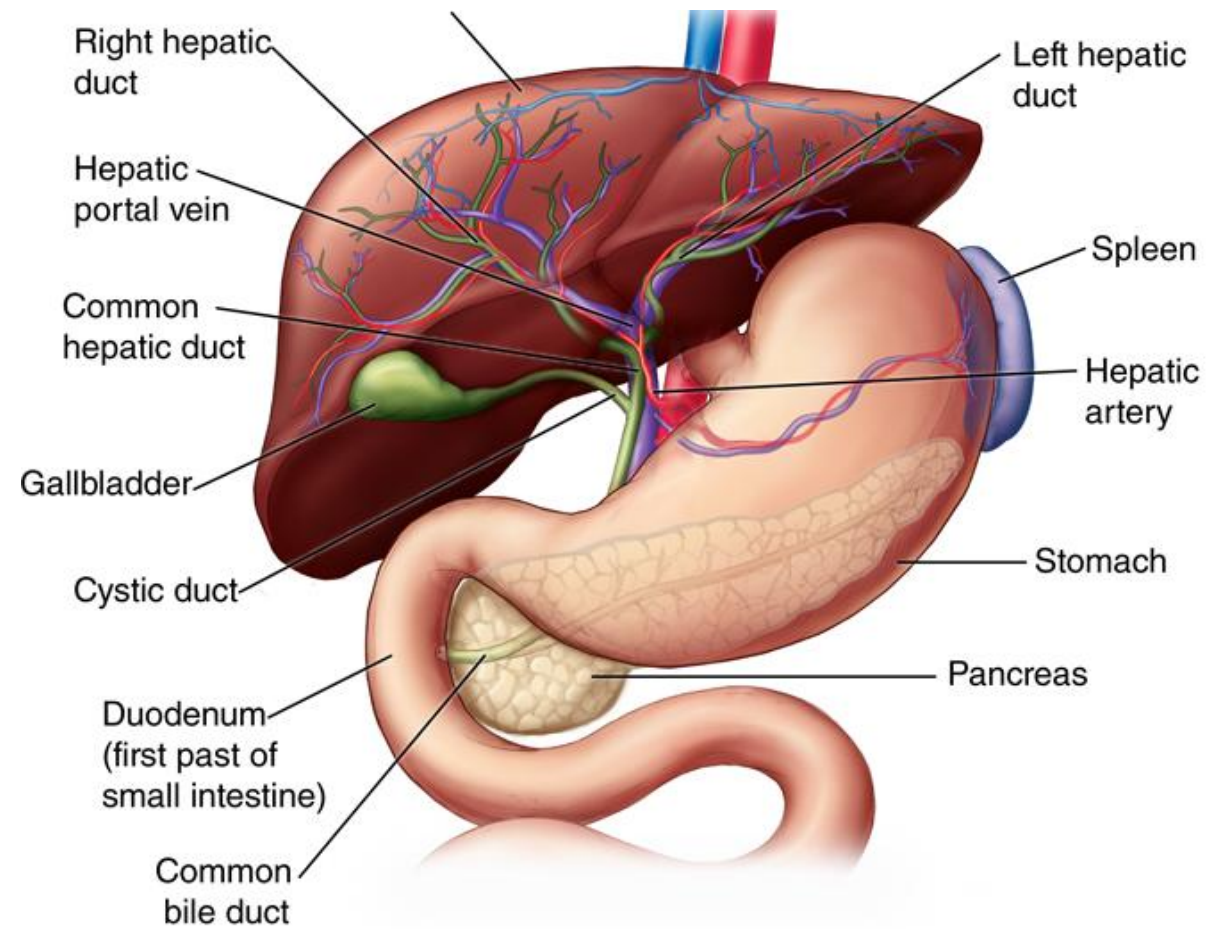
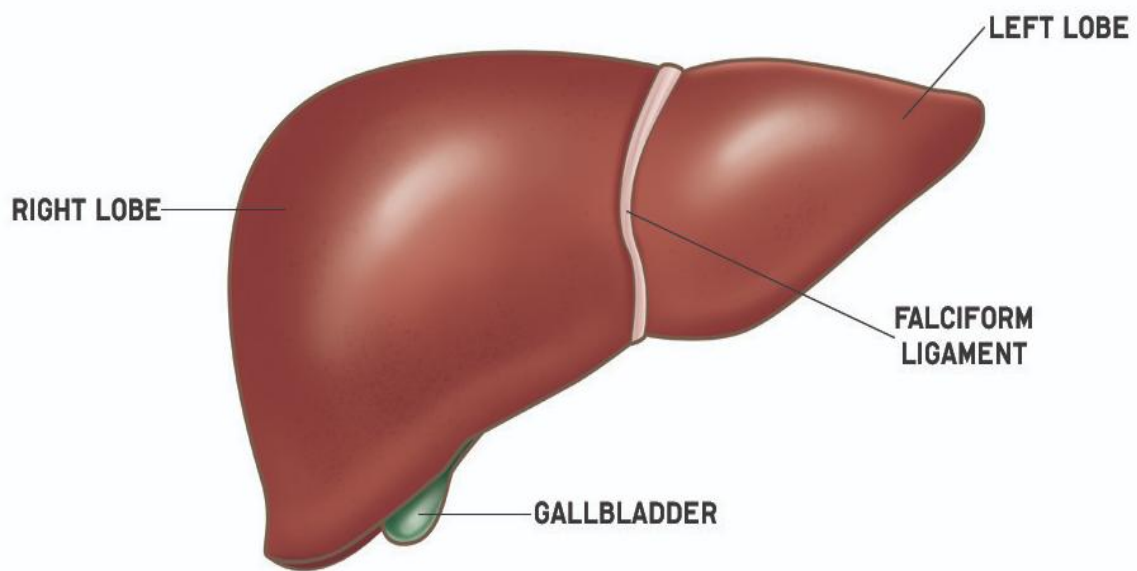
Function

- Proteins produced and secreted
- Play a major role in carbohydrate, protein, amino acids, and lipid metabolism
- Breakdown insulin and other hormones
- Breakdown bilirubin via glucuronidation to facilitate bile excretion
- store substances like glucose (in the form of glycogen)
- Store Vitamin A,B12,D,K, Iron, and Copper
- Produce albumin
- Phagocytosis through fixed macrophages (Kupffer cells)

Blood supply

- Hepatic A. and Hepatic V.





Gallbladder

- A small hollow organ, pear-shaped organ beneath the liver
- store and concentrate the bile before release to small intestine
- Sits in a shallow depression below the right lobe of the liver
- grey blue color, 7 to 10 cm in length, and 4 cm diameter
- 50 milliliters capacity
- opening into the cystic duct

anatomically divided into

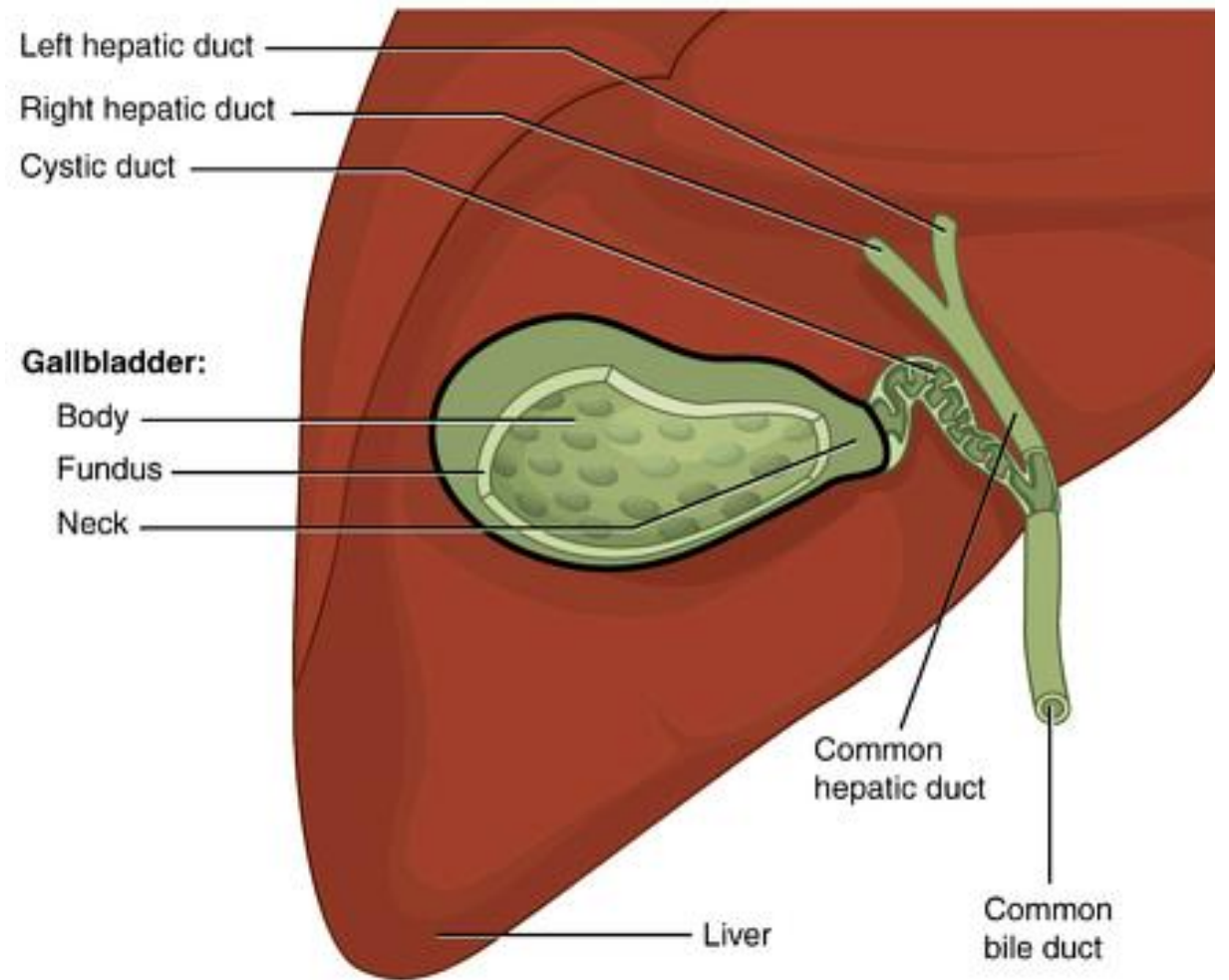
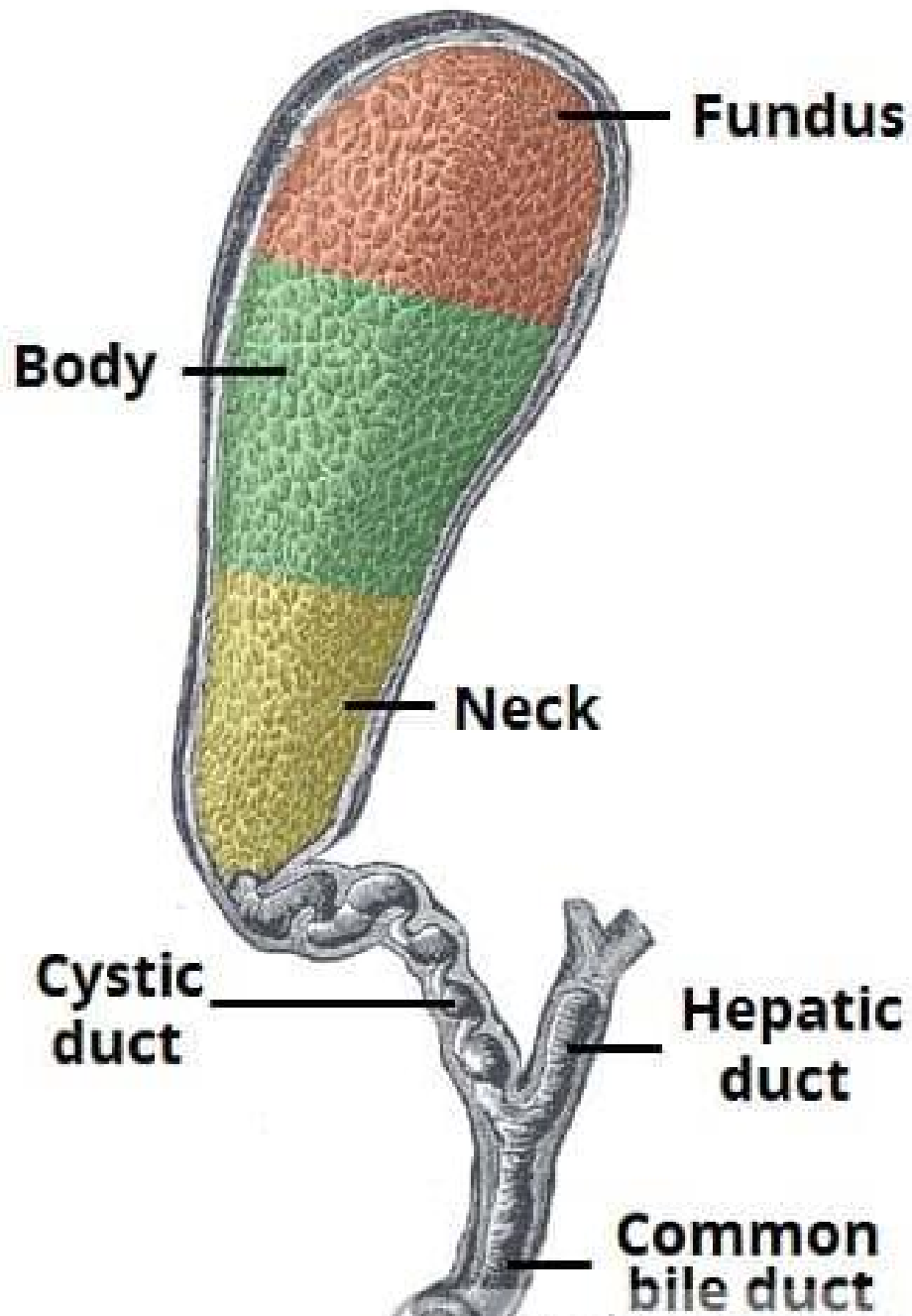
- fundus
- body
- neck

Function

- store and concentrate bile which need it in to fat metabolism
- Bile flows through small vessels into large hepatic duct and then through cystic duct into gallbladder to store it.

Blood supply

Cystic A and Cystic V.



Small intestine

Called Small bowel

part of gastrointestinal tract between the stomach and large intestine

The absorption site of most food intake

Length 3 - 5 m

Diameter 2.5 - 3 cm

Small intestine can be divided into three parts

Duodenum : short structure range between 20-25 cm

Jejunum: the second part and it is about 2.5 m

Ileum the third section of small intestine. about 3 m length

Small intestine

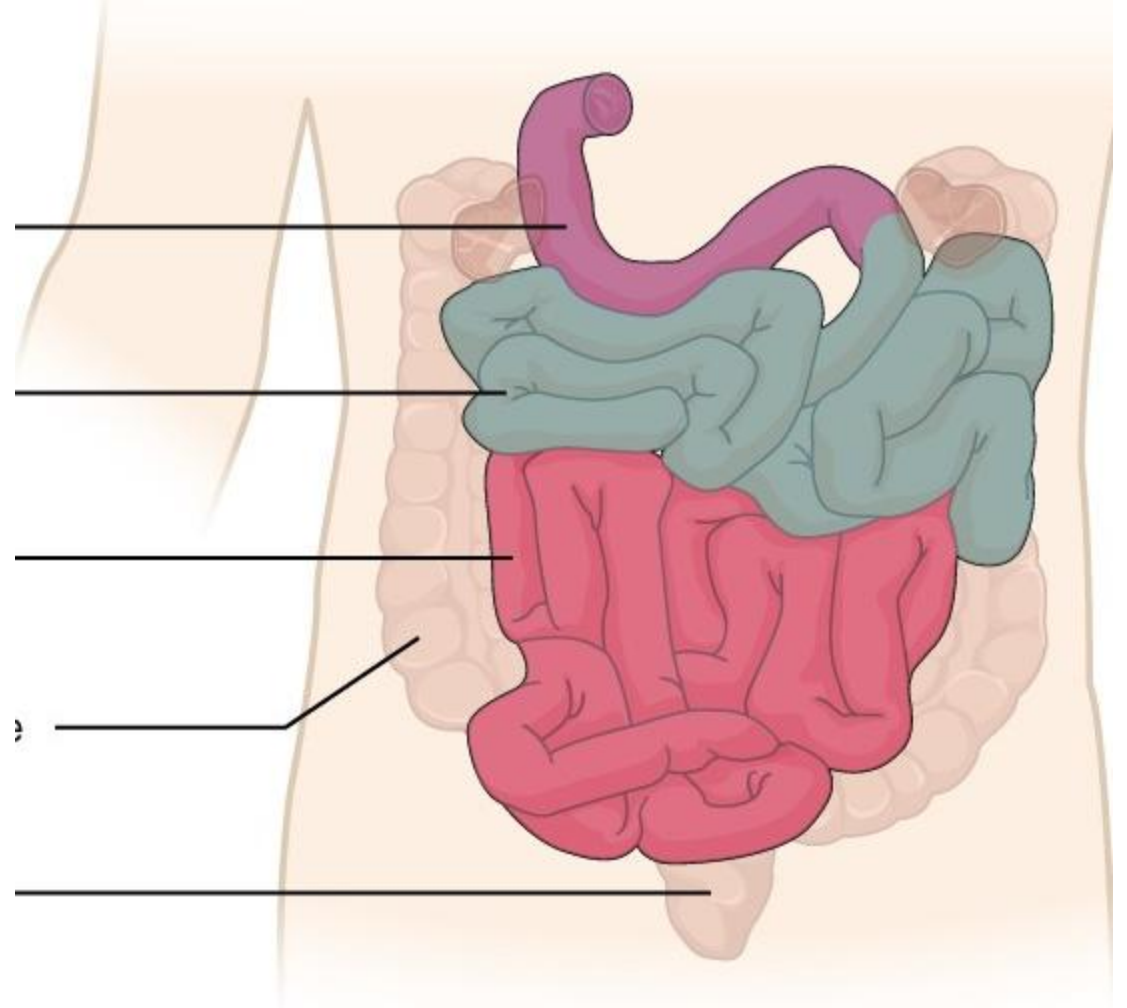
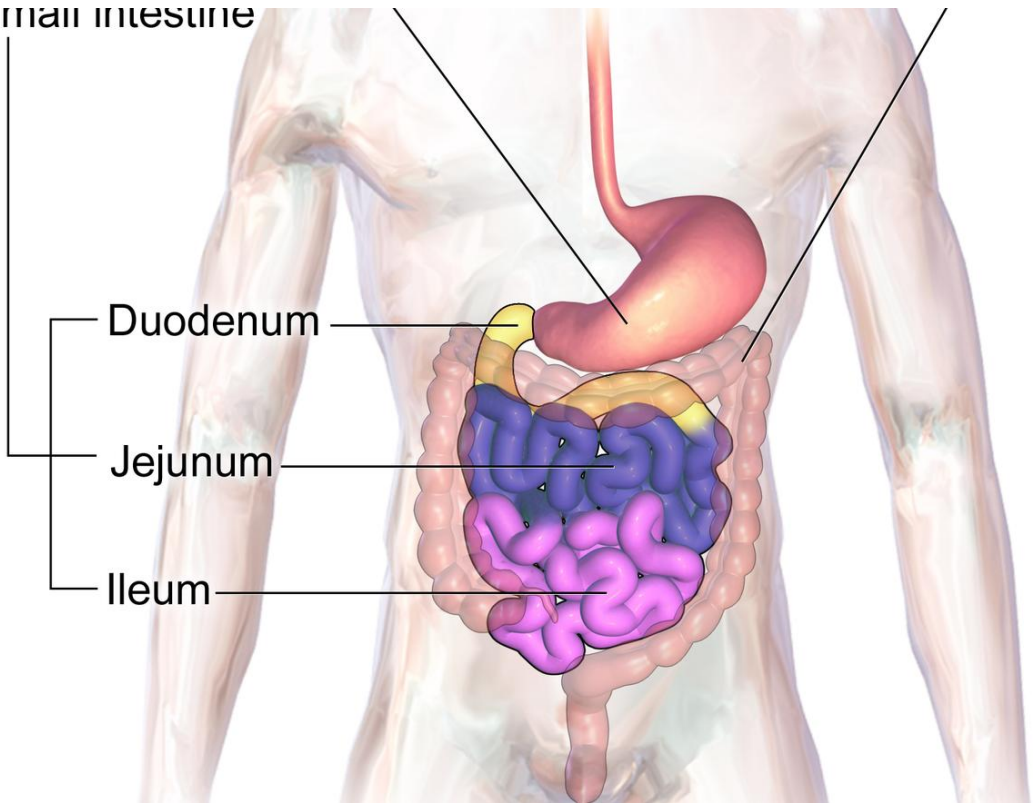
Function

- **Digestion** In the small intestine the most chemical digestion take place
- **Digestive enzymes** that secreted from pancrease and live act in the small intestine
- **Digestion protein and carbohydrates**
- **Absorption** : the small intestine wall is the area when the food acn cross into blood vessels. the food can be pass through either diffusion or active transport
- **Immunology** the small intestine employs its motility to sweep bacteria along, mucus, and antibacterial molecules secreted in the gastric acid, biliary juice, as well as substances produced by the commensal microflora and epithelial cells, such as Paneth cells.

Blood supply

Coeliac trunk, superior mesenteric A., and superior mesenteric v.

Small intestine



Large intestine

- Also known as the large bowel or colon
- the last part of GIT
- the site of water absorption and the remain waste material stored as feces before be removed by defecation
- the colon length is 166 cm in male and 155 cm in female
- **there are four sections in large intestine**
- cecum including appendix
- Colon consist of
 - ascending colon
 - transverse colon
 - descending colon
 - the sigmoid colon
- rectum
- anal canal

Large intestine

Structure:

The diameter of large intestine different from site to site.

ileocecal valve separate small intestine from large intestine and works to prevent colonic content from pass back to small intestine.

Ascending colon move the contents upward to transverse colon by peristalsis

Peristalsis is a radial movement of muscles.

Transverse colon start from hepatic flexure to splenic flexure

Descending colon begin from splenic flexure to sigmoid colon

Function of descending colon is to store feces

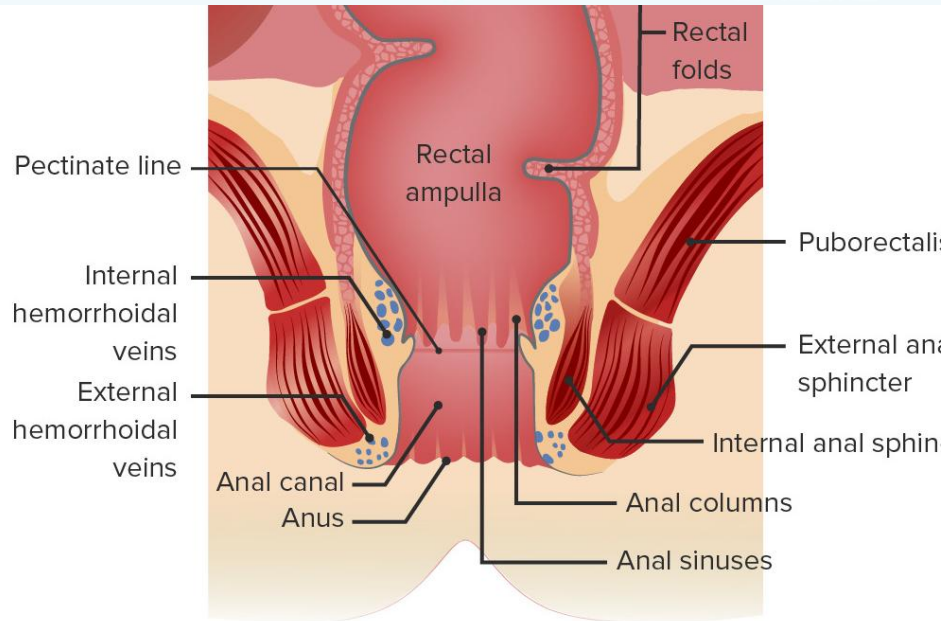
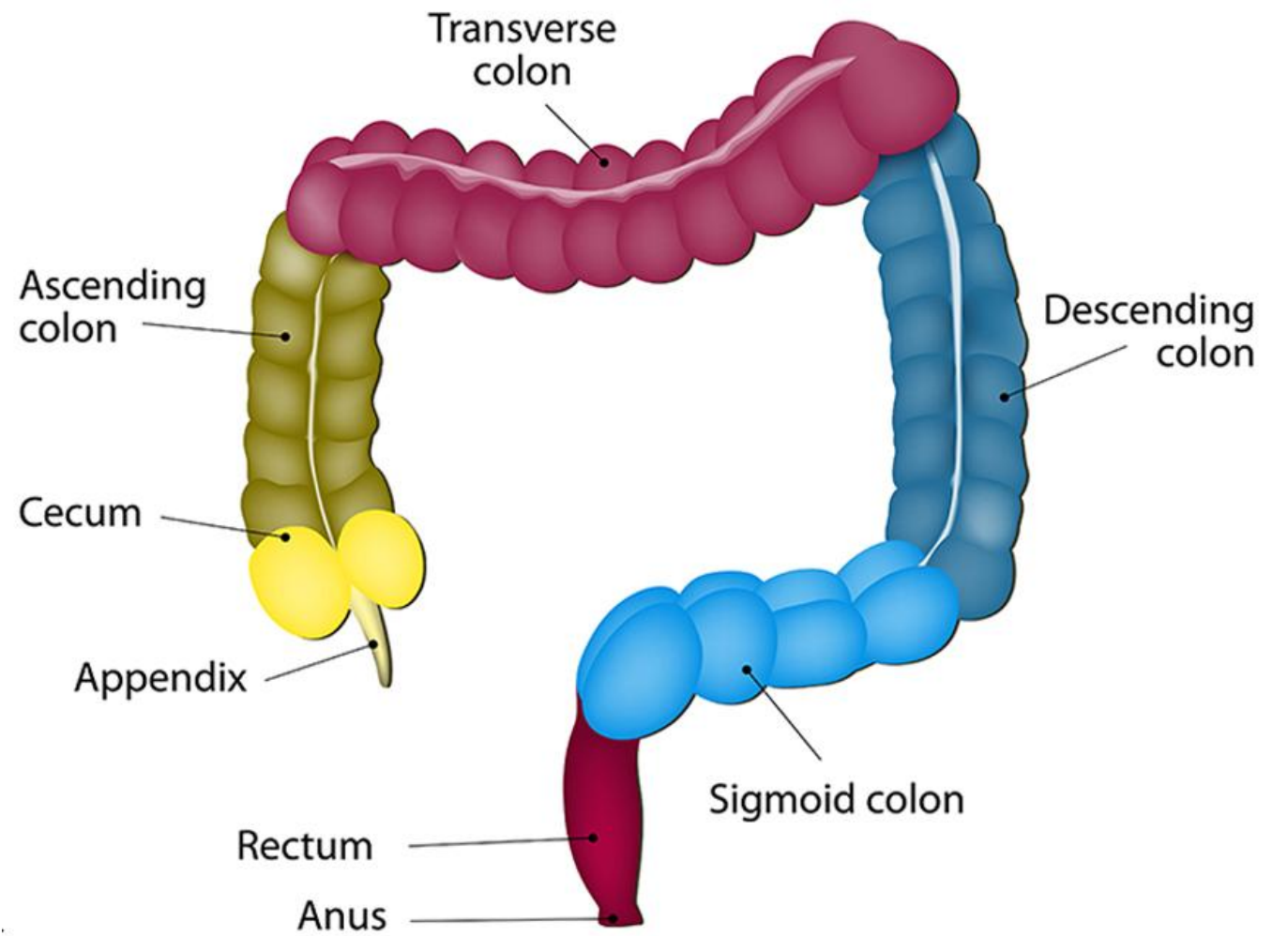
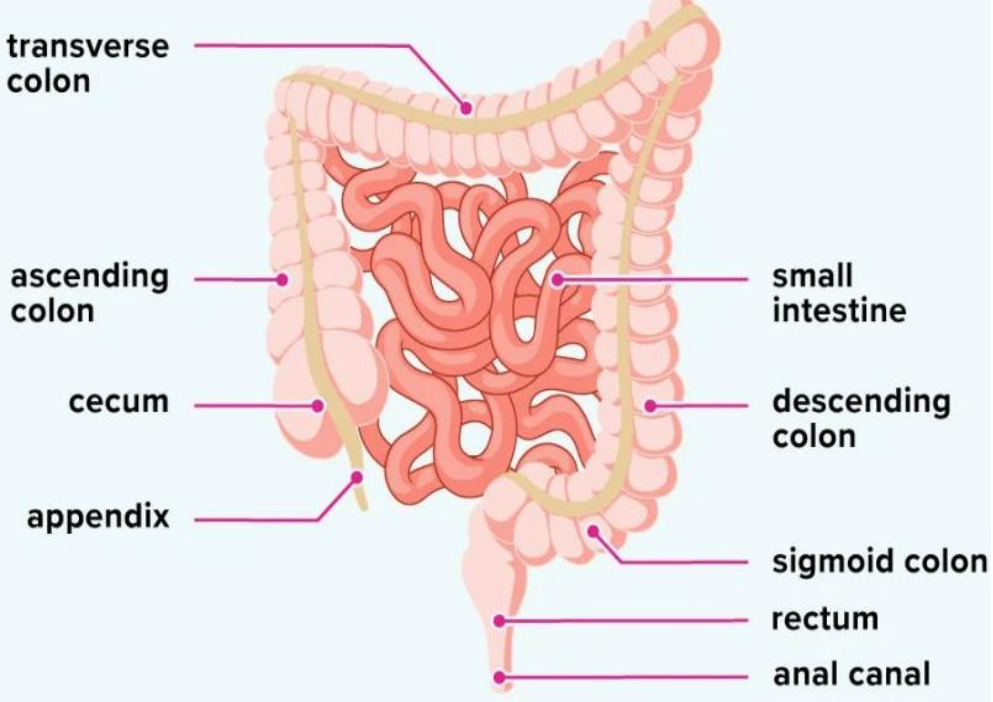
Sigmoid colon is the part between the descending colon to rectum. it is s shape muscular wall to increase the pressure that help rempving stool

Rectum it is the part of large intestine that work on holding feces awaiting elimination via defecation

Anal canal : The anal canal serves as a channel connecting the rectum to the end of the gastrointestinal system, the anus. It is located within the anal triangle of the perineum and in between the fat-filled and wedge-shaped ischioanal, or ischioanal, fossae

Anus

- **the external opening of the rectum**
- **function is to control the expulsion of feces**
- **there are two sphincters; internal sphincter and external sphincter.**
- **these sphincters contain circular muscles that help in maintaining the constriction**



Fuction of large intestine

- **Absorbs water and any remaining absorbable material.**
- **Colon absorbs Vitamins that created by colonic bacteria like Vit. K**
- **Large intestine houses over 700 species of bacteria (Gut flora) that preform a different functions.**
- **Undigested polysaccharides (fibers) metabolized to short chain fatty acids**

Blood supply

superior and inferior mesenteric A and superior and inferior mesenteric V

THANK YOU